Time: 1 ½ hr **Max Marks: 45**

Note : 1) Question no 1 is compulsory
2) Attempt any two questions from the remaining.
3) Assume suitable data, if required and state it clearly.

Q.1. Answer any five from the following **(5x3) 15**

a) State three features of JFET.
b) Explain the importance of surface to volume ratio in Nano materials.
c) In Common base connection, I_E = 1 mA, I_c = 0.95 mA, Calculate the value of I_B.
d) Explain why Varactor diode is called Voltage Variable Capacitor.
e) Write Diode Equation and explain the situation in forward and reverse bias .
f) Write the principle of Hall effect and explain the Hall coefficient.

(3 x 5) 15

Q. 2 a) Define Fermi Level. Show that Fermi Level Lies in the middle of the Forbidden energy gap of an intrinsic semiconductor.
b) Draw energy level diagram explaining the variation of Fermi level of n-type semiconductor with temperature.
c) Explain working of Solar Cell. Write its applications.

(3 x 5) 15

Q.3.a) Explain the p-n junction forward bias with energy level diagram.
b) Draw and explain I-V characteristics of Zener diode. What is Avalanche breakdown.
c) Find resistivity of intrinsic germanium at 300 K. Given density of carriers is 2.5x $10^{19}/m^3$. Mobility of electron is 0.39 m^2/volt-sec and mobility of holes is 0.19 m^2/ v-sec , charge of electron is 1.6x 10^{-19} C.

(3 x 5) 15

Q .4 a) Explain the working of NPN transistor in CB mode with neat diagram.
b) Define base current amplification factor (β) and emitter current amplification factor (α) and thus derive the relation between the two.
c) Explain the working principle of LED and write five advantages and five applications of it.

(3 x 5) 15

Q. 5 a) State the principle of electron beam lithography and explain its working.
b) Explain construction and working principle of photodiode.
c) Compare between FET and BJT.

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